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DOE Standards and Orders

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Objectives

- Become familiar with DOE Standards and Orders pertaining to criticality safety
- Discuss why the use of ANSI/ANS-8 standards in the DOE complex is acceptable
- Review the requirements for a Criticality Safety Evaluation in the DOE complex

DOE Orders and Requirements

List of Applicable Orders and Standards

- 10 CFR 830
- DOE Order 420.1, *Facility Safety*
- DOE Order 450.2, *Integrated Safety Management*
- National Consensus Standards- ANSI/ANS - 8 Series
- DOE-STD-3007-2007, *Guidelines for Preparing Nuclear Criticality Safety Evaluations at DOE Non-Reactor Nuclear Facilities*
- DOE-STD-1158-2010- *Self Assessment Standard for DOE Contractor Criticality Safety Programs*
- DOE-STD-1189-2008, Integration of Safety into the Design Process
- DOE-STD-1027-92, *Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports* ***(This version of the standard is specified by 10CFR830.)***
- DOE-STD-1186-2004, *Specific Administrative Controls*
- DOE-STD-3009-94, *Change Notice No. 3, Preparation Guide for US DOE Non-Reactor Nuclear Facility Documented Safety Analyses*

10 CFR 830, 830.204, Documented Safety Analysis, § (b)(6)

(6) With respect to a nonreactor nuclear facility with fissionable material in a form and amount sufficient to pose a potential for criticality, define a criticality safety program that:

i. Ensures that operations with fissionable material remain subcritical under all normal and credible abnormal conditions,

ii. Identifies applicable nuclear criticality safety standards, and

iii. Describes how the program meets applicable nuclear criticality safety standards.

Item i. comes from ANSI/ANS 8.1.

10 CFR 830, ANS 8.1, STD 3007, STD 3009
What is credible?

- **What does credible mean?**
  - Not based on numeric probability; based on whether a criticality event is believable, with the controls implemented.
  - With the controls implemented, given that controls will fail from time to time, does careful thought tell us that the chain(s) of events necessary to cause a criticality are beyond rational belief?
  - If a criticality accident cannot be precluded, the question becomes “Is the worker adequately protected?

What is credible?

- **Credible**
  - Believable, rational, plausible, *reasonable*
    - Can this event/upset realistically happen?
    - No numerical value is assigned to this definition
    - ISO 1709 equivalent
      - *"Consider all reasonably foreseen abnormal conditions"*
  - Words that it is not
    - Conceivable, imaginable, *possible, non-trivial*

DOE O 420.1, Facility Safety

- **Focuses on ANSI/ANS standards**
- **Requires a documented criticality safety program**
  - Each DOE Site must have one
  - Must be approved by DOE
- **Monitor for fissile material accumulation**
- **Criticality safety evaluations per DOE-STD-3007**
- **Includes the primary requirement for subcriticality under normal and credible abnormal conditions**

Why we use the ANSI/ANS Standards

- PL 104-113 requires the government to use industry consensus technical standards when they are applicable and available.
- We are also obligated by this law to participate in the development of industry consensus when possible.
- Several of the DOE criticality safety staff have participated for decades in the development of ANSI/ANS standards. Others have participated for years.
- The Senior DOE criticality safety staff thinks the ANS-8 standards are applicable and accurate.

DOE STD 1158, Self-assessment Standard for DOE Contractor Criticality Safety Programs

Provides detailed lines of inquiry related to self assessment per ANSI/ANS 8.19-2005, *Administrative Practices for Nuclear Criticality Safety*, as well as related standards

Regulatory Viewpoint: This is an assessment tool, ***NOT*** a compliance document

Compliance is with the ANSI/ANS 8 series of standards.

Focus Area	Criteria	Lines of Inquiry
Management Responsibilities	8	78
Supervisory Responsibilities	7	60
NCS Staff Responsibilities	7	43
Operating Procedures	9	69
Process Evals for NCS	4	49
Materials Control	6	29
Planned Response to NC Accidents	2	50

DOE STD 1158

- **Regulatory viewpoint - If you try to comply with this standard, we will know that your program is defective, and it will fail. If you use this standard to identify program weaknesses, and fix them, your program will likely succeed.**
- **You do not have to use every line of inquiry to get a reasonable picture of the health of your program.**
- **There are over 400 lines of inquiry. If you document every one of them in a single assessment, it will be too voluminous to be useful. Most sites set up their assessment schedules to go through all the focus areas at least once every three years.**
- **Many of the lines of inquiry are written so that the answers are open ended, intentionally making it impossible to have an implied right or wrong answer.**

DOE STD 3007-2007, The NCSE Standard

- NCSE or CSE: The process evaluation for criticality safety
- Introduction: Why is the evaluation being done. Short, not technical.
- Process Description: What is being analyzed. Include process assumptions which impact the evaluation.
- Unique requirements: Use if there are requirements beyond the normal requirements for a CSE. Usually not necessary.
- Methodology and Validation: How are you going to determine what you analyze is subcritical?

3007-2007

- The Process Analysis and Evaluation and Results sections are often combined.
- Process Analysis: Analyze and document the normal and credible abnormal conditions
  - Not to be confused with Process Description
- Evaluation and Results: Determine that the normal and credible abnormal conditions are subcritical.
- Credited Controls and Assumptions: Identify the Hardware, Administrative Controls, and Assumptions that assure the system is subcritical under normal and credible abnormal conditions.

3007-2007

- **Make it easy for your customers to read and understand where the safety envelope is.**
- **The customers are Line Management and operators**
  - **NOT** regulators, auditors, and review committees.
- **Regulators expect operations to get work done. We require that it be done safely.**
- **There is no law about delivery schedules; there is one about nuclear criticality safety.**

Questions?